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REMARKS

ON FRACTURES,

EMBRACING A DESCRIPTION

**OF AN IMPROVED APPARATUS FOR THE TREATMENT
OF FRACTURES AND OTHER AFFECTIONS OF
THE LOWER EXTREMITIES.**

BY J. B. WHITRIDGE, M.D.

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BOSTON:

WELLS AND LILLY, COURT-STREET.

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REMARKS ON FRACTURES,

Embracing a Description of an improved Apparatus for the Treatment of Fractures and other Affections of the Lower Extremities.

SUCH were the splendid discoveries made by the celebrated Dr Wm and Mr John Hunter, anterior to the year 1783, as almost to create a new era in the annals of surgery ;—and such have been the successive improvements by a host of others, since that period, that on a superficial view of the subject, one would almost be induced to believe, that scarcely any thing further remained to be done. But a scientific and more thorough investigation of this branch of the healing art, unavoidably leads to a different opinion ; and above all, a practical acquaintance with the diversified operations of nature, and the various means by which she may be aided and assisted in her natural and healthy actions, or restrained, or wholly controuled in her fantastic gambols and wildest frenzies, necessarily compels us to come to a very different conclusion.

Notwithstanding, therefore, the many and various improvements which have already been made, much yet remains to be done.

‘ What can be said of those surgeons (in the language of Desault) who, from servile attachment to a particular form of apparatus,’ or a particular mode of treatment, do not consider a fracture cured unless that plan is adopted which they have derived from their teachers or have learned from their books. ‘ Servile imitators in an art which calls for genius

in its votaries, they are only capable of following, without reflection or judgment, the steps of their predecessors.'

An apparatus for the cure of fractures of the os femoris, (generally acknowledged to be) invented by Desault, and subsequently improved by Physick and others, according to Dr Caldwell, is the ultimatum of all improvement on this subject.* With due deference to the opinion of the learned professor, I would submit for consideration and further trial a description of an apparatus for fractures and *other* affections of the lower extremities, which I humbly conceive to be some improvement upon every other species of apparatus for similar purposes, which has hitherto come under my observation.

In the course of my surgical practice, a case of oblique compound fracture of the tibia and fibula occurred in the year 1817, in which I very much felt the want of some improvement in the methodus medendi of fractures of this description.

In October of that year, Major J. B., a very respectable old gentleman of this city, had the misfortune to fracture both bones of his left leg, about three inches above the malleoli. The fracture was so remarkably oblique and ragged, that the spine of the tibia presented a sharp spiculum of bone, which pierced the integuments, and thereby produced a compound fracture. Not being able to preserve a perfect coaptation of the bones by the ordinary splints, or by any means then in my power, in consequence of the great irritability and restlessness of the patient, the ragged ends of the bones, together with other causes which at that time existed, produced such an irritation as to occasion a strong and permanent retraction of the muscles, which unavoidably resulted in a diminution of the length and considerable deformity of the limb.

It ought to be our ambition, in this age of improvement, to restore a broken bone in such a manner that the injury shall not be perceptible without the most minute examination.

* See his opinion as expressed in the Appendix to Desault's Surgery.

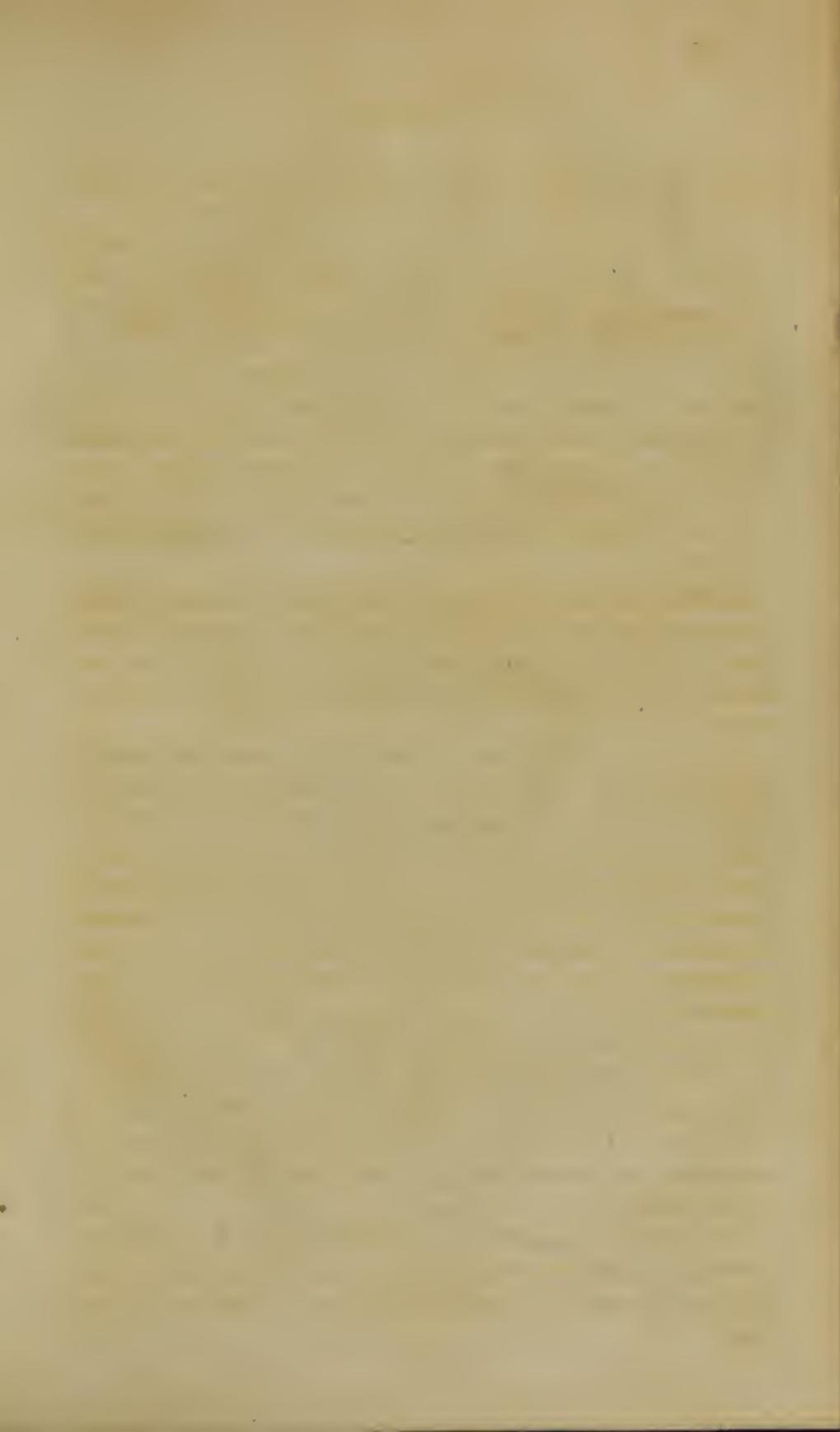


Plate. I.

Fig 1.

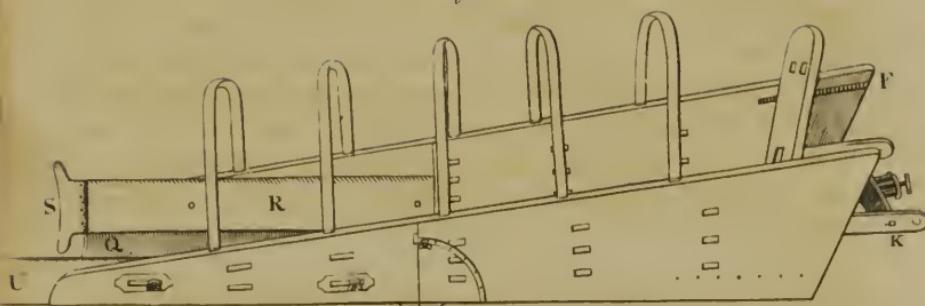


Fig 11.

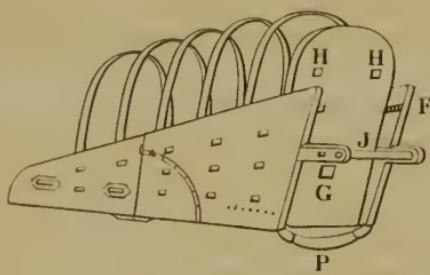
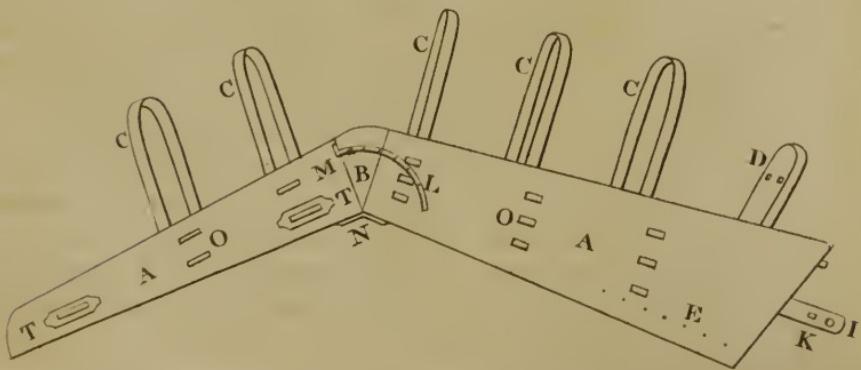


Fig III.



By the above case I became convinced, that so far from ever being able to effect a neat cure of an oblique fracture of the *thigh*, by simply laying the limb out upon a bed or mat-trass, according to Mr John Bell,—that even in cases of oblique fracture of both bones of the *leg*, wherever the action of the muscles is considerable, some means are necessary to resist their contractile power, and to keep the fractured portions of bone in apposition. For this and similar purposes, and on that occasion, the following apparatus was constructed.

Description of the Apparatus, with References to the Plate.

Fig. I. Represents a perspective view.

Fig. II. A posterior view.

Fig. III. A lateral or profile view.

- AA. Two pieces of mahogany (Fig. III.) constituting one side, the upper portion about eighteen and the lower about twenty inches in length, and seven inches wide at the bottom.
- B. The joint, which slides into a mortise.
- CCCCC. Five whalebone hoops to support the bed clothes.
- D. The foot-board, to give support to the foot, especially in cases of comminuted or compound fractures, wounds of muscles, tendons, blood vessels, &c., without which the weight of the foot would be constantly dragging downwards, and continually bringing the extensor muscles into action, which would not only be fatiguing, but often very painful.
- E. Small holes, into which an iron bolt or pin with a brass knob is placed, for the purpose of fixing the bottom of the foot-board. By changing this from one to another of these holes, the foot-board may be moved up or down several inches, so as to accommodate it to the length of almost any leg, for which it may be required. That part of this machine which supports the thigh, is somewhat shorter than the thigh of the tallest adult, so that the same apparatus may be accommodated to persons whose legs vary in length six or eight inches, or more, by elevating the trunk of the body by means of a pillow or

cushion for a short limb, or elevating the machine by the same means, for the accommodation of a long one. It is also somewhat wider at the top, (being ten inches at the top and eight at the bottom) so as to correspond with the taper of the leg.

- FF. A steel spring, (Fig. I. and II.) with its fellow opposite, filled with notches, that receive the foot-piece, the edges of which are defended by two brass plates that play in these notches, so as to give it a firm support. The bottom being fixed by means of the bolt before described, the top may be moved up or down at pleasure, so as to flex or extend the foot to any angle required.
- G. A large mortise in Fig. II. through which a soft buckskin band or silk handkerchief may be passed when extension is necessary.
- HH. Two small mortises, through which straps or bands are passed which go round the foot, for the purpose of giving it lateral support, and to prevent rotation. I have ever found it an important matter, in the treatment of all fractures of the lower extremities, to maintain a proper position of the foot.
- I. A piece of mahogany dovetailed to the side in Fig. III. (corresponding with one opposite) and removable at pleasure, connected by the cross piece J, (Fig. II.) for the purpose of making extension when required; which is done by bringing the straps of a buckskin gaiter, silk handkerchief, or whatever may be used, through the mortise G, and simply tying it round the cross bar. But if a screw be thought necessary for the purpose of making more uniform and gentle extension, according to the plan of Boyer, a tourniquet may be attached to a flat cross bar adapted to the mortise K, (as represented in Fig. I.) which answers all the purposes of a fixed and permanent screw. In cases where no extension is required, in order to reduce the length of the machine, and render it more compact, this portion of it may be removed.
- L. A brass quadrant, (Fig. III.) corresponding with one upon the opposite side, permanently attached at M, and pierced with several small holes, through which, after passing the side piece A, a small iron screw bolt (with a brass head) passes, which is secured by a brass thumb-nut upon the outside. By being changed from one to another of these holes,

the machine may be fixed so as to flex the thigh upon the pelvis, and the leg upon the thigh, to any angle required. By this contrivance it will be perceived that a limb may be placed in the most flexed or the most extended position, or the muscles may be relaxed to the greatest degree of which they are collectively capable, at the pleasure of the surgeon.

N. A brass hinge, corresponding with one upon the opposite side.

OO. Twelve small mortises, (the same number on the other side, but not exactly opposite) through any of which broad straps or bandages may be passed to draw the whole limb, or any part of it, from side to side, and to secure it in any situation required. They may be so applied as either to elevate or depress the end of a broken bone, or any portion of a distorted limb, or draw it to either side, as circumstances may require. By this arrangement a free circulation of air about the limb is also allowed, and the bolsters and bags of chaff of Desault, and the pads and cushions of others, are superseded; which being in a great measure non-conductors, an unnecessary accumulation of heat is avoided.

P. One of the cross pieces (Fig. II.) which connect the two lateral portions of the machine together, and the only one seen in the drawing. Of these there are six, forming segments of a circle, connected by tenons to two longitudinal pieces of wood of about two inches in breadth, which constitute the base of the frame, and to which the canvass Q (Fig. I.) is permanently though loosely attached so as to form an elastic bottom, the joint and ends of which are supported by webbing. The cross pieces are excavated in such a manner, that the canvass, which is so loosely nailed in as to form a considerable depression in the centre, does not touch them; and when a suitable feather pillow is placed in the machine, covered with a clean linen, or a coloured cambric, or calico case, the whole forms as comfortable and as easy a bed for a broken or otherwise diseased limb as can well be imagined.

Extension made at the foot, with the leg flexed upon the thigh, must obviously operate upon the leg only. The counter-extending power will be the canvass bottom, at the joint B, and will operate upon the lower and back part of the thigh. To make extension

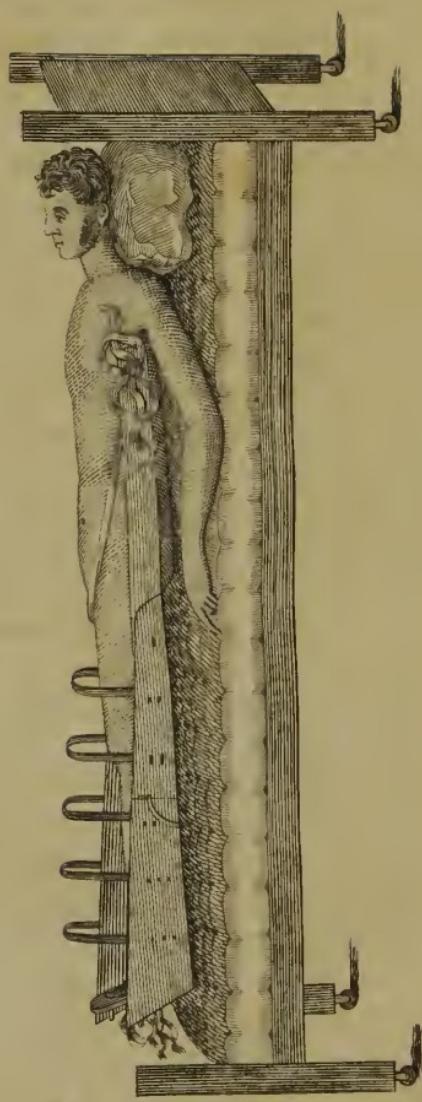
upon the thigh, with the thigh flexed upon the pelvis, and the leg upon the thigh, the force must be applied at the upper and back part of the leg, and counter-extension made at the pelvis.

For this purpose a piece of mahogany R, (Fig. I.) about three inches wide, with a head similar to a crutch S, covered with soft buckskin, and stuffed with curled hair, is attached to the inside of one of the lateral portions, by two pins which slide up and down in a groove, and are fixed by nuts which screw up upon thin plates of brass, which are let into the wood upon the outside, as at TT, Fig. III. The upper part of the machine being wider than the middle, this piece and U, the long splint of Duverny, which is attached to the opposite side in the same manner, are beveled off so as not only to be parallel to each other, but to present a smooth even surface upon the inside of the machine. These splints, if such they can be called, may be changed from one side to the other for the accommodation of either right or left leg; or may be retracted or extended so as to adapt the instrument to almost any case for which it may be required. When the thigh is flexed upon the pelvis, the short splint only can be used, the head of which will then rest upon the os pubis. In the extended position it will rest upon the tuberosity of the ischium, while the long splint will extend nearly to the axilla.

At the upper part of the long splint U, are two mortises (not seen in the figure) for the reception of the ends of a broad buck-skin band, silk handkerchief, or whatever may be used, which connects it with the perineum, and assists in the counter-extension. Although the perineum and parts adjacent sustain the whole counter-extending force, some advantage is gained by this arrangement, inasmuch as the pressure will be in some measure divided; one splint will operate perpendicularly and the other obliquely, and of course will not exert their force upon exactly the same points. But another important advantage is, that the force applied to the upper end of the long splint is returned to the lower end of the machine, and counterbalances that applied to the other side, and keeps the whole apparatus steady.

I have long since abandoned the use of the crutch-head for the purpose of making counter-extension at the axilla, however high and distinguished the authority by which it is recommended. Past experience assures me, that from the great mobility of the shoulder, no firm resistance is afforded,

Plate. 2.



and therefore the crutch-head superadded to Duverny's splint by Dr Physick cannot be advantageously employed. If the axilla presented the same resistance to the counter-extending power that the perineum does, then the pressure from which so much mischief sometimes results, might be divided between these two points, and thereby much advantage gained. There is, however, obviously some advantage gained by using a splint which extends nearly to the axilla, inasmuch as the counter-extension is then more in the direction of the limb, and not so oblique as in Desault's apparatus, and consequently not so liable to occasion displacement, by drawing the upper portion of the bone outwards. In fractures and other diseases of the legs, both these appendages are unnecessary, and of course may be removed. In transverse fractures of the thighs, and even in oblique fracture of the inferior portion of the os femoris, especially when the action of the muscles is feeble, and a moderate degree of extension is sufficient to overcome them, the semi-flexed position may be adopted, and one of these splints, viz. the short one, will be sufficient. In oblique fracture above the middle, the extended or straight position is to be preferred, and both splints will then be necessary.

Plate II. Represents the whole apparatus applied to the limb.

Much has been said of the absolute necessity of the extended position of a limb in all cases of fracture of the os femoris. I am inclined to think this is true only in oblique fractures of the upper portion, or in cases of fracture of the head or neck of that bone.*

* Fractures within the capsular ligament, according to Sir Astley Cooper, never unite by ossific granulations, but by ligamentous substance, owing, as he confesses, to the parts not being kept firmly in contact. May not this be the fault of the apparatus, or the mode of treatment, or perhaps both? He thinks fractures of the cervix femoris, without the capsular ligament, may be kept in contact, and firmly united by bony concretions or callus.

For my own part I cannot conceive why the same means should not prove equally successful in both cases, unless it is owing to some difference in the organization of the parts. There is, I am aware, a well known difference in the cancelli, and in the density of the general substance of the head and neck of the bone, which I should suppose would afford a more satisfactory solution of the question.

The action of the psoas magnus, iliacus internus, triceps, adductor femoris, the gluteal and other muscles situated about the pelvis, particularly the long head of the triceps, the gluteus maximus and psoas magnus, are so strong as to require the limb to be placed in an extended position to enable the operator to make sufficient extension and counter-extension to overcome the action of these and other muscles concerned.

It is obvious, that the higher a fracture takes place, the greater the number of muscles which act upon the inferior portion of the fractured bone, and consequently the greater the retraction of the limb, and the greater the extending and counter-extending force required. In a fracture of the head or neck of the femur, we have to resist the action of nearly all the muscles situated about the pelvis, and most of those of the thigh ; in short, all the muscles destined to move either leg or thigh which have their origin at the pelvis.

With regard to position, without entering into an elaborate discussion of the subject, as to the relative merits of the flexed or extended position, I will only observe further, that as far as my limited experience goes, I am led to the conclusion, that although a patient may by habit and good moral discipline be brought to bear the pain of extension and counter-extension in the straight position, and consequently the continued action of the extensor muscles, with a tolerable degree of comfort, the flexed position, so much advocated by Mr Pott, Mr Charles Bell, Sir Astley Cooper, and most of the English surgeons, is, upon the whole, the easiest ; and as it behoves us at all times to endeavour to diminish the sufferings of our patients as much as possible, we ought ever to adopt those means which contribute most to that end. In transverse fractures, and in almost all oblique fractures of the leg and lower half of the thigh, the flexed position may be adopted by means of the above apparatus. This apparatus possesses all the advantages of the doubly inclined plane of Mr Charles Bell,* together with

* A machine upon this principle, originally invented by Mr White of Manchester, and subsequently improved by Mr James of Hoddesden, has been in use in Guy's Hospital for more than five and twenty years past, for fractures of the os femoris.—*Vide Cooper and Travers' Surgical Essays, page 261.*

those of the foot-board, the lateral bands, the means of extension, counter-extension, &c.

The flexed position of the arm, Desault long since demonstrated to be the best, by his angular splint for the elbow, and which the experience of Dr Physick and others in this country abundantly confirms.

One of the principal objections which most of the French surgeons make to the flexed or semi-flexed position of the inferior extremities (and indeed all those who exclusively advocate the extended position) is, the difficulty which they apprehend exists in comparing the two limbs with each other, supposing but one to be broken. Now I cannot conceive why points and angles may not be as accurately defined and compared, and their respective distances as clearly marked, in a crooked as in a straight line. In fractures of the lower extremities, according to my plan of treatment, the patient is placed upon the back, and if the fractured limb is flexed to any particular angle, the other, if it is a sound one, may certainly be flexed to the same angle; then where, I would ask, is the difficulty in comparing the several points and angles, the patellæ, the tuberosities of the tibiæ, the malleoli, the ossa calcis, &c. If both are broken, the difficulty of comparison, I apprehend, is as great in the extended, as in the flexed position.

As confinement to the bed from three to six weeks or more will be necessary in almost all fractures of the lower extremities, my experience leads me to recommend that the patient be placed on the back. The back presents the greatest surface, its superficies afford the most points, and will in general best sustain the weight of the body. This position too is the most convenient, not only for the application of mine, but of every kind of apparatus.

We are told in the Memoirs of the Academy of Surgery, that "three or four months are often necessary for the healing of fractures of the os femoris." The immediate or proximate cause of this tardy operation, no doubt, is, MOTION.

Whencever a cure is so protracted, there is reason to apprehend either some neglect on the part of the surgeon, some fault in his mode of treatment, or some imperfection of his apparatus, as the sequel will by and by show.

The relation which the fragments bear to each other is not uniformly supported, nor are they maintained in a sufficiently passive state to admit of a speedy re-union, but are suffered to act upon each other by the power of the muscles. And hence, the success will be in proportion as the arrangement of the fragments are more or less frequently interrupted.

Nature certainly does not require so long a period to repair an injury of this kind when duly assisted by art, unless perhaps in some very old and superannuated subjects. And even among those, where the *vis medicatrix naturæ* is adequate to effect the reunion of the bones at all, it is presumed there are but few, if any, to be met with in such a state of decrepitude as to require three or four months to complete the cure, provided proper means are employed, and due attention paid throughout the treatment.

We hear very little complaint of a want of timely success in fractures of other bones of the body, especially those of a smaller class. And why? The reason is obvious; because the muscles which act upon them are less powerful and oppose less resistance to the mechanical means employed to overcome them, consequently there is less difficulty presented in keeping the fragments in their proper position.

Reasoning from analogy, we should suppose, *ceteris paribus*, that the *os femoris* when fractured was capable of re-uniting at least as soon as any other bone of the extremities. It is situated nearer the fountain of circulation; is better supplied with blood-vessels and nerves; has more sensibility, more animal heat; in short, more of the vital principle than bones which are more remote. We should therefore conclude, that so far as a physical reparation of the fractured portions depends upon the action of its own vessels, the femur would recover sooner than many other bones, all other things being equal.

To keep the ends of a broken bone in apposition, and the limb immovably fixed in the easiest possible position during the process of ossification or the formation of callus, has long been a desideratum in surgery. To attempt or to expect to cure fractures without keeping the parts uniformly in

contact, or nearly so, and without rest, appears to me altogether chimerical, whatever may have been said to the contrary notwithstanding.

Mr Amesbury, of London, has lately published an account of an apparatus, by which he proposes to cure fractures of the lower extremities, and yet permit his patients 'to ride or walk about at pleasure' during the process.* Having never seen this instrument, I am both unable and unwilling to controvert the position. The apparatus being complicated, and the description of it unaccompanied by a drawing, is consequently obscure.

What success those can have who indulge their patients in a perpetual motion, or who recommend an occasional or daily† extension to be made upon the limb, I am unable to say. Such measures I certainly should not expect would be successful in my hands.

The union of soft parts, even integuments and muscles, which are subject to motion, is oftentimes attended with great difficulty. I have several times known the operation of a hare-lip unsuccessful until after two or three attempts, in consequence of the crying of a child. And if soft parts fail from this cause, which so readily unite by adhesive inflammation when kept uniformly in contact, how much more liable must the firm hard bones be to a failure in this respect, the re-union of which is comparatively so slow, tedious, and oftentimes difficult, especially in old persons, even when a perfect adaptation of their fractured surfaces is uniformly preserved !

Motion at that point, where the solution of continuity has taken place in a bone, is liable to produce what has inaptly been called an artificial joint, but which, I think, might with more propriety be said to be a joint produced for want of art. It is on account of motion, that the cure is so protracted in some cases and artificial joints produced in others. As far as my observation and experience go, extension, when-

* Medico-Chirurgical Review, Vol. III. p. 920.

† Principles of Surgery.—Philosophical Journal, &c.

ever extension is necessary, should be *uniform and permanent.*

In making this remark, I am aware that I am controverting some very high authorities, among whom are Mr John Bell and Dr Davidge of Baltimore. But my convictions are not the less strong, on that account. And in transverse fractures and other cases which require no extension, it is not the less necessary to preserve a uniform and perfect coaptation of the bones.

My military reminiscences furnish a case which occurred at the battle of Little York, in Upper Canada, of a soldier by the name of M'Minn, who had the radius and ulna both broken, the former in two places, by a shower of stones, which was occasioned by the springing of a mine and blowing up of the fort by the British, just as our troops were getting possession. The gallant general Pike, who led the troops upon this occasion, fell a victim to the explosion. In consequence of the heavy duty which devolved upon the regimental surgeons after the battle, and the want of comfortable accommodations for the sick and wounded, M'Minn was either neglected or badly treated by those who first had charge of him. Union of the bones took place, but with great distortion of the limb. About three weeks after, he was removed from the hospital of the regiment to which he belonged, and placed in the general hospital, under the charge of a gentleman of distinguished ability and great experience (and one of the senior officers of the medical staff) who thought proper to break up the newly formed connections and reduce the fracture secundum artem. This was done, and suitable splints and dressings applied; but the surgeon was never able again to unite the bones. An artificial joint was the consequence. The arm was almost as flexible in the middle as at the elbow or wrist.

The vicissitudes incident to the sick and wounded of an army during the active operations of a military campaign, subsequently placed this brave Hibernian under my immediate care. Although at the time in fine health and spirits, and able to lift almost as much in a perpendicular direction

with the broken arm as he ever could, he was at the same time unable to raise a pound weight with the arm in a horizontal position. The fracture of the bones did not destroy or materially diminish the power of the muscles. They only seemed to require a lever, or something to act upon, as the wheel of the pully in the horizontal position.

In preference to the seton first introduced into notice by Baron Boyer in France, and on this side of the Atlantic by our illustrious countryman Dr Physick, I proposed to dissect out the intermediate portion of bone, which was about one and a half or two inches in length, and, by means of Hay's saw, to remove a section of each fractured portion of the radius and ulna, with a view of exciting sufficient inflammation to produce healthy action, with a hope, and in the expectation, that the secerning arteries would throw out sufficient ossific or cartilaginous matter, to supply the deficiency of bone, and thereby restore the strength and usefulness of the limb.* The operation was objected to, and consequently abandoned, the unfortunate soldier placed on the pension list, and finally discharged from the army.

The idea of extending a fractured limb a little beyond the length of the sound one, especially in oblique fractures of the os femoris, was suggested to me by two cases which occurred in the winter of 1819 and 20, in which I tried the effect of it with good success, and have ever since had reference to this circumstance in the treatment of all oblique fractures.†

It should be recollected, that by fixing the pelvis as firmly as possible and making extension upon a sound limb, it is capable of being considerably elongated by the yielding of the ligaments of the joints. The same will hold good in making extension upon a fractured limb. The ligaments of the joints will yield somewhat as well as the muscles. A

* According to the experiments of Sir Astley Cooper, the intermediate space between the fragments of bone which do not actually touch, is not filled by bony, but by ligamentary or cartilaginous matter.

† This idea also attracted the attention of Dr Flagg, and has been judiciously noticed in his paper in this Journal, on fractures of the os femoris.

limb may, therefore, be considerably elongated without placing the ends of a fractured bone asunder. And in oblique fractures, without some precaution of this kind, there will be a very great liability to a shortening of the limb. The degree of extension required, depends on a variety of circumstances, and can only be governed by the experience and judgment of the surgeon.

In making extension and counter-extension, some attention will be necessary in the choice of the materials we make use of for this purpose, as well as to the mode of their application. The gaiter, on account of covering a greater surface, and embracing the foot and ankle more generally, is preferable to any other mode of applying the means of extension ; and buck-skin for this purpose, and for the counter-extending and lateral bands, is preferable to most other materials, as being softer, more elastic, and consequently less liable to excoriate. Even these, under some circumstances, require the aid of soft pads, as in old, emaciated, and in delicate female subjects, the texture of whose skin so easily suffers abrasion ; and if the means are persevered in, is sometimes followed by ulceration, especially when the fracture is in the upper third of the os femoris, and the force applied necessarily severe.

The long continued pressure of a silk handkerchief (an inelastic substance, which, according to the usual mode of application, operates upon two points only) sometimes produces ulceration and sloughing at the tendo Achilles and instep.

In the spring of 1825, a circumstance of this kind occurred in the case of an old lady eighty years of age, who had the misfortune to fracture the os femoris at the cervix. And in another instance, ulceration wherever the handkerchief was applied, whether above the calf of the leg or knee.

Long continued pressure from any extending power, even though it be slight, is not only irksome but liable to produce these mischievous effects, and thereby in a great measure to defeat the object in view.

Hence, it may be inferred, that in delicate subjects, too

much attention cannot be paid, in the first instance, to the selection of the softest and most delicate materials for this purpose.

The arm of a lady's kid glove, stuffed with carded cotton, makes a very neat pad either for the perineum or ankle.

With the apparatus above described, the common short splints will not be essentially necessary, but as an accompaniment they will in general be found useful auxiliaries in fractures of the leg and thigh below the upper third ; and I would therefore recommend them, inasmuch as they embrace the parts closely and prevent any lateral displacement, either by spasms, sudden emotions, or starting during sleep, in consequence of dreams, to which patients under such circumstances are liable. In fractures above the trochanter, they are of no use.

The only other dressings required (except in cases of compound fracture) is the eighteen tailed bandage, or, what is perhaps preferable, Scultet's bandage of strips, over which the whale-bone, the palmetto,* or paste board splints, properly padded, may be placed and secured with straps or pieces of tape.

This apparatus affords every necessary facility for the application of the eighteen tailed bandage, or any dressings which may be required for a compound fracture or other disease of the limb. And simply for the fractures of the leg, it will I think be perceived, that this apparatus has some decided advantages over that contrived by the late Dr James Hutchinson, especially in cases of fracture near the knee ; and in all cases the irritation of his counter-extending bandages will be avoided. And from the manner in which his counter-extension is made, especially where the action of the muscles is strong, and much force is required to overcome them, the circular bandage to which the splints are

* The palmetto (*chamærops* of Elliott) found about the shores of Carolina and Georgia, affords an excellent material for the construction of splints for ordinary purposes—the woody substance of which is softer than paste board, and not like that liable to bend on being wet.

attached, is not only liable to excoriate the parts, but is also liable to obstruct the circulation.

In the progress of the cure of almost every simple fracture, friction with a flesh-brush after adhesion has taken place, will be found to be a very useful auxiliary means of exciting cutaneous action, of stimulating the parts generally, and thereby promoting the healing process.

A more simple apparatus than that above described I have sometimes made use of in fractures of the os femoris, especially when those accidents occurred in the upper part of that bone. It is constructed somewhat upon the principles of Desault, and is a modification of Hartshorn's improvement.

It consists of two boards, each about seven inches wide, one of which extends nearly to the axilla, with two mortises near the top, for the reception of the counter-extending band, which connects it with the perineum. The other has a head similar to a common crutch, covered and stuffed like the other apparatus, and which presses against the tuberosity of the ischium. The lower extremities of these two boards extend about six inches below the foot, and are firmly connected by three cross bars which are pinned upon the outside, over either of which extension may be made simply by tying, or by attaching a tourniquet, as may be found most convenient.

Through the sides of each of these pieces are several mortises for the reception of straps or bandages, which are passed round the limb and tied on each side to the bars between them, for the purpose of giving lateral support, and fixing it as firmly as possible, as in the other apparatus, and which in general supersedes the necessity of bandages round the body, which were so distressing to the 'imagination' of Mr John Bell.

This simple contrivance may be got up at short notice and with very little trouble, and answers nearly all the purposes of the more complicated apparatus for the extended position alone, the advantages of the foot board and canvass bottom excepted, which are by no means inconsiderable. To take

off the weight of the bed clothes, which would of course increase the difficulty arising from a want of support to the foot, a hoop may be attached. The length of these splints is such, that if the patient lies upon a soft mattrass or feather bed (which, from the long continued confinement in one position it is necessary for him to do) unless the limb is well supported, I may almost say suspended by lateral bandages, it is liable to sink down in the middle by its own gravity as well as that of the trunk, as every one practically acquainted with the application of such splints must be aware; and thus, with all the extension and counter-extension, the process may perhaps produce a crooked limb at last. This difficulty is entirely obviated by the canvass bottom of the other apparatus, upon which the limb lies both firmly and easily.

It is true some support may be given to the centre by means of the many tailed bandage, and the short splints in common use, but these must be kept very tight and uncomfortable to prevent the evil complained of; and it is not always easy to preserve a uniform arrangement of the dressings, and the same degree of pressure, under all the vicissitudes to which a limb is subject during the process of osteogony, or the formation of callus.

At one time, all the circumjacent parts are inflamed and swollen; at another, perhaps in a state of suppuration; and, at a third, shrivelled and eniaciated.

From these circumstances, without constant vigilance and attention, they are liable to become too tense at one period and too loose at another, and instead of subserving the useful purpose for which they were designed, they become a source of irritation and an incumbrance to the patient.

Desault, aware of the difficulty to which I allude, recommended the use of a hard mattrass placed upon a bedstead with a plank bottom, the distress arising from which may be avoided by the foregoing plan of treatment.

If the reader's patience is not already exhausted by a subject, the details of which are necessarily dry and uninteresting, the effect of these principles may be further illustrated by the following case.

This case is not selected because it is peculiarly adapted to explain the physiological principles of the disease, or the mechanical principles of the apparatus used for its removal, but because it is a formidable one, and presents difficulties which seldom occur, and such as will rarely be met with in private practice. Besides, it shows the insufficiency of the *vis medicatrix naturæ* to repair the injury which nature herself sometimes sustains ; and when, and how far, art may interpose to mitigate the sufferings of humanity, and restore the natural and healthy actions of the human system.

Capt P——, an active, enterprising young man, then second officer of the ship —— Capt N—— master, was wrecked at sea in a gale of wind, in the month of February, 1818. During the violence of the gale, which carried away some of the masts and spars, a sea was shipped which completely swept the deck. Mr P—— providentially escaped being washed overboard with some of the crew, by clinging to the shrouds. In the midst of the disaster the long boat was dashed against him, and his hip severely shattered. He remained at sea in this deplorable condition for thirty-five days. On the arrival of the vessel in port, he was taken to the marine hospital, where three attempts were made on successive days, to reduce what was conceived to be a luxation at the hip-joint.

A stanchion was erected, which served as a counter-extending power. Prodigious extension was then made by means of a ship's block and tackle which overcame the contraction of the muscles, and drew the limb down sufficiently ; but instead of remaining in its proper situation, it would immediately recede on relaxing the pulley, which led the operators to conclude that during the period which had elapsed since the occurrence of the accident, the acetabulum had filled up and become quite obliterated, and that this circumstance prevented the reception of the head of the os femoris into its former cavity. The case was abandoned as incurable, and the man discharged from the hospital.* App-

* This was the statement of the patient, and his friend Capt N——.

plication was then made to me, and the patient placed under my charge.*

I found him on crutches in a most horribly distorted condition ; his left leg, about four inches shorter than the other, hung dangling by its side ; the foot and knee turned outwards at right angles with the other ; the trochanter major turned backwards, and resting upon the dorsum illii. On a critical examination of this case, I found it to be a fracture of the cervix femoris. The head of the bone could not be felt ; the eversion of the foot, the subduction of the trochanter, the small arch of a circle which it described on rotation of the limb, and all the symptoms and circumstances of the case, confirmed the opinion.

He was directed to be placed in bed, and to have the muscles of the pelvis and thigh lubricated and softened by being well rubbed every two or three hours with the camphorated liniment. This was continued for two days. Their stiffness and rigidity being then in some measure overcome, I applied the modified apparatus above described, and made gentle extension at the foot. The lubrication was continued, and the extension and counter-extension increased, for four days, at which time the foot, without any very great degree of pain or suffering, was brought down to the length of the other, so as to enable me to place the ends of the fractured bone in contact.

This being effected, the parts were adjusted so as to restore the symmetry of a well made person, and maintained in their proper situation by the lateral bands ; a proper position of the foot established, and uniform and permanent extension made. This was continued for six weeks, at the end of which time he was suffered to get up and use his feet, and with the help of crutches to walk about at pleasure. These were soon thrown aside, and Mr P—— embarked for Boston ; after which I did not see him until the last season. He then called on me, without crutch or

* In the subsequent treatment of this case, I was kindly assisted by a medical friend, for whose politeness and attention I would make due acknowledgment.

stick, as the master of a fine ship, exhibiting a sturdy appearance, with but a slight deformity or shortening of the affected limb, which did not in the smallest degree incapacitate him for the performance of any of the duties of his profession.

This case proves that bones may re-unite long after the occurrence of the accident which separates them, provided they are kept uniformly in apposition. And I apprehend that want of similar success in M'Minn's case must have been for want of those means and that discipline which is necessary to preserve injured parts in a state of perfect quiescence, as well as to preserve the constitution from the baneful influences of such potations as lead to an occasional or an habitual inebriation, a practice to which M'Minn had been unfortunately addicted.

It also proves, that the long continued contraction of the muscles and the consequent shortening of the limb may be overcome by efforts comparatively mild, when those efforts are uniform and permanent. Whilst means far more powerful, which are transient in their operation, would be unavailing.

' I will close this article by a few remarks on the advantages of permanent extension in old fractures. Nature reunites fractures differently, according to the relation of the divided surfaces to each other. Are those surfaces in perfect contact ? If so, they are chiefly instrumental in the formation of callus, which then probably acts in a manner similar to the re-union of wounds. On the other hand, does an overlapping of the fragments separate the divided surfaces from each other ; the re-union takes place then principally on the sides, by a kind of enlargement of the bones, produced no doubt by the periosteum. Such is the mode of consolidation, which, on opening dead bodies, is found in most oblique fractures of the os femoris, succeeded by a shortening of the limb.

' Hence it follows, that this shortening, which would readily yield to extension, at the time of the fracture, becomes obstinate in its resistance, in proportion to the age of the

accident. In such a case, indeed, the substances destined to re-unite the overlapping fragments, acquiring daily more and more solidity, oppose to the reduction obstacles constantly increasing. Hence, most practitioners regard this reduction as beyond the resources of art, after the expiration of the twelfth or fifteenth day. Nor is this opinion entertained without some foundation ; for at a later period, almost all efforts at reduction, however powerful, have proved unavailing.

But that which cannot be performed by a very powerful effort, acting momentarily, is notwithstanding, oftentimes easily attainable by a much weaker one, provided it be long continued.*

Among the variety of machinery, both ancient and modern, with which the profession abounds, and the mass of apparatus which the world has seen, Dr Davidge, in the Baltimore Philosophical Journal and Review, recommends (if machinery of any kind is employed) "the fracture bedstead" upon the plan of Mr Henning.

I shall omit any discussion of the subject as to the relative merits or demerits of the many mechanical contrivances which the talents and ingenuity of surgeons have presented to the public, leaving that to the discrimination and judgment of those who may be called to use them.

Before quitting the subject, it may be necessary to observe, that in almost all fractures of the lower extremities, there is more or less difficulty in the use of the bed-pan. This difficulty may be in a great measure obviated by the use of the apparatus represented in the drawing. The leg being supported on the canvass bottom of the machine, two assistants can easily raise the patient sufficiently to admit the bed-pan.

I would, however, recommend Jenk's elevator to those who have it at command, as being the best mode of elevating a patient, either for this or any other purpose.

Charleston, South Carolina, April, 1827.

* Desault's Surgery, page 254.



